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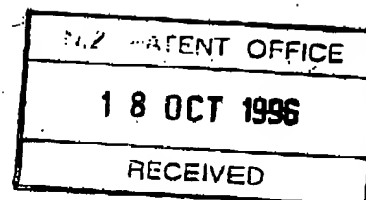
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PATENTS ACT, 1953

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Date:

COMPLETE SPECIFICATION

A SEA URCHIN FOOD PRODUCT

I, MITSUO HORIGUCHI, a Japanese citizen, of 5429-1 Ohnohara, Ohnohara-cho, Mitoyo-gun, Kagawa-ken, 769-16 Japan, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:

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The present invention relates to a sea urchin food product and to a method of making that food product.

Sea urchins are members of a large group of marine invertebrates in the phylum Echinodermata (spiny skinned animals). All sea urchins have a hard calcareous shell called a test, which is covered with a thin epithelium and is usually armed with spines. The economically valuable part of the sea urchin comprises the five skeins of roe located within the internal cavity of the test. The sexes are generally separate in sea urchins. The gonads of both sexes are equally valuable and are generally referred to as roe. In this specification the word "roe" therefore includes the milt of the male sea urchin as well as the ovary and associated egg mass of the female sea urchin. To obtain the roe of a sea urchin, the test is cracked open and the roe is carefully removed with a spoon. The roe is then usually cleaned by being rinsed ready for consumption, packing or processing.

Sea urchin roe is often sold in its raw state, either fresh or following processing. An alternative processing involves cooking the roe. The purpose of processing the roe, whether by cooking or otherwise, is to inhibit spoiling by bacterial and fungal contamination and/or to preserve or enhance desirable properties of the roe, such as its colour. The processing facilitates the packing and the transportation of the roe to domestic and overseas markets. Japan is a major market for sea urchin roe where it is known as "uni". Fresh roe is highly perishable and transportation time is critical in maintaining quality.

To a large extent, the type of processing used depends on the type of product desired. Some known processing methods and products are as follows:

**1 "Fresh" roe (uni or nama uni)**

The roe are placed in stackable strainers which are in turn placed in tanks containing a solution of anhydrous potassium alum in cold saltwater. The roe are soaked until they become firm, that usually taking about 15-60 minutes, and then they are drained and packed in trays. Prior to transportation, the trays are bulk-packed in insulated cartons with an artificial coolant.

**2 Salted roe (shio uni)**

Methods of salting vary as does subsequent processing, depending on requirements.

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Typically, alternating layers of roe and salt are placed on layers of cheesecloth supported on racks. The roe are allowed to drain for a few hours during which time they lose 40-50% of their moisture and absorb salt. The salted roe are then packed for transportation. Depending on the amount of salt absorbed by the roe, they may be frozen to enhance their preservation.

Mud roe (dori uni) comprises salted roe which is fermented.

Kneaded roe is roe mixed with roasted salt on a board, the roe then being pressed into a container after they have lost a sufficient amount of moisture to enhance their preservation.

### 3 Steamed roe (mushi uni)

The roe are steamed until they have lost about 20-30% of their moisture and are then packed and frozen.

### 4 Baked roe (yaki uni)

The roe are placed in shallow dishes and baked in an oven at about 190°C for about 30 minutes to remove about 30-40% of their moisture. The cooked roe are then packed in trays or in imitation scallop shells and frozen.

In an alternative cooking process, the roe may be cooked over charcoal in a clam shell.

### 5 Frozen roe (reito uni)

Fresh roe are packed in trays or bags and frozen. Good quality roe can be consumed as is when thawed. Poor quality roe is usually intended for further processing after being thawed.

The best quality roe is preserved for the fresh product, which brings the best prices. Secondary products are made from broken roe, or roe that is off-colour, too large, or leaking fluids excessively. The cracking of the test and the extraction of the roe must be done carefully to avoid breaking the whole roe. Broken roe is generally not acceptable by the market for eating raw. It can only be discarded or processed to form secondary products. In addition, the roe can only be discarded or used for further processing when it is of a poor colour; for example, when it is dark or discoloured and unappealing to the eye. The best quality roe is a bright yellow or orange colour. The size of the roe is also important in some markets, and especially the Japanese market where the preferred size

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is about 40-50mm. The roe of many species of sea urchin common in non-Japanese waters tend to be larger and of lesser value in the Japanese market. Thus the best value roe have good colour and appearance, an appropriate size, are firm, and are free of leaking fluids.

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These rather stringent requirements mean that a large proportion of the roe is not available for consumption as fresh whole roe but is either wasted or is available for processing into lower value secondary products. For example, in processing mud roe, only about 65-70% of the raw roe weight can be used on average, and about 45-60% in the case of kneaded roe. The percentage usable as just the fresh raw roe may be as low as about 3.6-4.4% by weight. This means that the cost of the fresh raw product is high, and when processing of the whole roe is involved, it usually takes a long time overall and so these particular processed products can be an expensive delicacy.

15 A particular problem exists with the sea urchin, including species common in New Zealand waters, such as that known by the Maori name of kina (*Evechinus chloroticus*). The roe is rather prone to break; especially when cooked, for example, in the shell, where the roe may disintegrate and lose its original shape and its commercial value.

20 It was with problems such as mentioned above in mind that the present invention was devised.

An object of at least one embodiment of the invention is to provide a baked sea urchin food product wherein whole roe are present in the product, which roe, or many of them, are substantially visible in order to give the food product eye appeal to the customer.

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An object of at least one embodiment of the invention is to provide a baked sea urchin food product wherein broken roe are used in the product, which roe are not suitable for eating raw, and providing the food product to the customer at relatively low cost.

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An object of at least one embodiment of the invention is to provide a baked sea urchin food product in a plate-like or a bar-like form, which is preferably suitable for use in Japanese dishes, such as sushi, for example. The term "plate-like" includes "sheet-like", such a food product having a generally spread flat form from being baked in a substantially flat-bottomed dish or mould. The term "bar-like" means an elongated food product having any desired cross-sectional shape, whether square, rectangular, round or oval, or other geometric shape. The baked sea urchin food product is capable of being cut

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to size, and may be made of a size, consistency and shape to be capable of being rolled up or folded.

An object of at least one embodiment of the invention is to provide a baked sea urchin food product which uses the roe of the kina (*Evechinus chloroticus*).

While it is not necessary that all the above-mentioned objects be met by any one embodiment of the invention, they are all met by the most preferred embodiment of the invention.

Another object of the invention, or an alternative object of the invention, is to provide the public with a useful choice.

In one aspect the present invention broadly consists in a sea urchin food product comprising sea urchin roe mixed with an edible binding material and baked to form said food product in unitary form.

In another aspect the present invention broadly consists in a method of making a sea urchin food product comprising the steps of mixing sea urchin roe with an edible binding material, and baking the mixture to form said food product in unitary form.

The roe used in the food product may comprise only broken roe. This has the disadvantage of there being no whole roe present to be visible and add eye appeal to the product from the point of view of the customer. However, there are the advantages of providing an economically worthwhile use for broken roe, and of giving the flavour of the roe to the food product.

The preferred food product contains whole roe. The preferred whole roe substantially retain their original shape in the baked food product. Furthermore, the whole roe, or many of them are also preferably substantially visible in the food product in order to give the food product eye appeal to the customer. It is possible to use whole roe of a lesser quality than would be acceptable for sale as fresh raw roe. For example, whole roe which has some discolouration or which is otherwise too big may be used. Alternatively, such lesser quality whole roe is preferably broken down and used as broken roe.

The preferred food product containing whole roe may also contain broken roe to make use of the broken roe and to enhance the flavour of the food product.

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After the food product has been baked, the edible binding material holds the roe, whether whole and/or broken, in a unitary form in the food product and maintains the shape of the food product. As already indicated, this shape is preferably plate-like or bar-like in form. The binding material also provides support for the whole roe when used, helping to prevent the whole roe from breaking and disintegrating when baked. The individual whole roe when packed close together also provide support for each other.

For the edible binding material, chemical binding additives can be used, provided they are edible and effectively bind the roe in a unitary product when baked. However, having regard to taste, flour made from non-glutinous or glutinous rice mixed with egg is used as the preferred binding material, although a binding material made from wheat flour or starch mixed with egg may also be used. Flour and starch may also be used together. The colour of the baked food product is improved if only egg yolks are used, but the binding effect of the binding material is improved if egg whites are also added.

The colour of the baked food product is important. Fresh roe are usually a yellow or an orange colour. The baked food product should have a colour in the range from yellow to orange to a reddish or brownish-yellow or a reddish or brownish-orange, suggestive of the fresh raw roe. The colour imparted to the binding material by egg yolk helps achieve this.

A seasoning may be included in the food product. For example, one or more seasonings selected from mirin vinegar, vinegar, wine, sake, and amino acids may be mixed in with the binding material when it is being prepared. The amount of seasoning used is chosen according to taste.

The above passages have broadly defined and generally described the present invention, some preferred examples of which will now be described with reference to the accompanying drawings in which:

Figure 1 shows the ingredients of the food product, comprising whole roe and binding material, placed in a dish or mould ready for baking into a plate-like form;

Figure 2 shows the baked, plate-like food product after its removal from the mould; and

Figure 3 shows a baked bar-like food product according to the present invention.

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**Exempl 1**

Roe from the New Zealand sea urchin or kina are used. That roe which is unsuitable for eating raw because it is broken, or is of poor colour, or is oversize, is mixed with an edible binding material. The edible binding material comprises non-glutinous or glutinous rice flour mixed with egg yolk, or whole egg. The mixture of the roe and the edible binding material should be in the form of a viscous liquid or paste capable of flowing. To this mixture are added whole (undamaged) roe substantially retaining their original shape. Figure 1 shows the whole roe 1 and the binding material 2 including the broken roe placed in a mould 3. The whole roe may be added to the binding material prior to these ingredients being poured into the mould. Otherwise, the whole roe may be placed in the mould first and then binding material poured into the mould or vice versa. Whatever method is used, the whole roe or many of them should be substantially visible to give the resulting product greater eye appeal.

It is desirable that the roe, and especially whole roe, make up most of the food product. For example, the binding material may comprise only about 8g of rice flour or about 10g of wheat flour and one whole egg for every 200g of roe in total.

A typical mould has as its internal dimensions, a length of about 180mm, a width of about 100mm, and a depth of about 10mm. The mould can be made of aluminium or aluminium alloy and can have a thickness of about 2mm, though it can be made of other materials and have other dimensions. The mould and its contents are placed in an oven and baked at about 150-200°C for about 15-25 minutes. The baked food product can be determined to be ready when it is browned to a fox-like colour, that is, a reddish or brownish-yellow or a reddish or brownish-orange colour. The time needed to bake the product properly varies somewhat, depending on the nature of the roe used as the raw material, and must be adjusted accordingly.

The type of oven used to bake the product can be a batch type or a continuous type, this latter type allowing assembly line processing and baking of the food product.

The baked food product 4 when removed from the mould has a plate-like shape as shown in Figure 2. It is a convenient size and shape and consistency to be sliced into rolled sushi fillings. However, other sizes and shapes of mould may be used. Further, while the mould of Figure 1 has a single receptacle, moulds which have multiple receptacles may also be used.



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While the food product may be sold in its plate-like form, it can be turned into a rolled up form or a folded form after it has been baked and removed from the mould.

#### Example 2

- 5 This example is the same as Example 1, except that only whole roe 1 are used. In other words, no broken roe is mixed in with the binding material 2.

#### Example 3

- 10 This example is the same as Example 1, except that the ingredients are placed into and are baked in a bar-like mould (not shown) to produce a bar-like food product 5, such as that shown in Figure 3. A typical bar-like mould has a length of about 180mm and a cross-section that is about 20mm square or less, for example, about 10mm square. As has been mentioned, the bar-like product may have other cross-sectional shapes, with the bar-like mould being shaped accordingly to give the desired result.

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#### Example 4

This example is the same as Example 3, with the further exception that only whole roe are used, without any broken roe being mixed in with the binding material.

- 20 The baked food product of these Examples, or otherwise, may be consumed as freshly baked, or it may be packaged for later use. Vacuum packed packages of the baked food product may be boiled, for example, for about 15 minutes to substantially sterilize the contents and to give the packaged food product a shelf life of about six months. This packaged food product is preferably kept refrigerated to ensure such a good shelf life.
- 25 Such packages are especially convenient for transporting the food product to distant markets and where it is not desired to use the product immediately.

- 30 The sea urchin food product and the method of making it according to the present invention differ from the prior art sea urchin food products and the methods whereby those prior art products are made. The prior art products in the form of individual whole roe, whether raw or cooked, are expensive delicacies. The food product of the present invention, when made in a plate-like form, can be sliced lengthwise and made into the core of sushi rolls. Alternatively, the bar-like food product can be used directly as the core for sushi. In either case, the food product can be used with other ingredients in sushi,
- 35 for example, sliced cucumber, to make kina-cucumber sushi. Furthermore, either the plate-like or the bar-like product can be cut into desired shapes and sizes and eaten with preferred sauces and dressings such as mayonnaise, wasabi, and soy sauce. Other uses

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are as a snack accompanying alcoholic beverages, as a topping for some dishes, for example, to make kina donburi (rice bowl), and as a gift. It will be understood that these examples of uses are not exhaustive.

- 5 Further, so-called broken or damaged roe, or roe otherwise unsuitable for eating raw because of poor colour, condition, or size can be used to add flavour and value to the baked food product while still providing a reasonably priced product. When whole roe are present in the food product, as is preferred, the most striking effect is that the baked food product of the present invention can have much the same flavour and taste sensation
- 10 as that which can be experienced with whole roe baked on their own.

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## WHAT I CLAIM IS:

1. A sea urchin food product comprising sea urchin roe mixed with an edible binding material and baked to form said food product in unitary form.

2. A food product according to claim 1, wherein the roe comprises broken roe.

3. A food product according to claim 1 or 2, wherein the roe comprises whole roe.

4. A food product according to claim 3, wherein the whole roe substantially retains its original shape in the food product.

5. A food product according to claim 3 or 4, wherein whole roe are substantially visible at the surface of the baked food product.

6. A food product according to any one of the preceding claims, wherein the binding material comprises an ingredient selected from the group consisting of flour, starch, and a mixture thereof, mixed with egg.

7. A food product according to claim 6, wherein the flour is selected from the group consisting of rice flour, wheat flour, and a mixture thereof.

8. A food product according to any one of the preceding claims, wherein a seasoning is included in the food product.

9. A food product according to claim 8, wherein the seasoning is selected from the group consisting of mirin vinegar, vinegar, wine, sake, an amino acid, and any mixture thereof.

10. A food product according to any one of the preceding claims, wherein the food product has a colour in the range from yellow to orange to a reddish or brownish-yellow or a reddish or brownish-orange.

11. A food product according to any one of the preceding claims, wherein the food product is in the form of a plate-like or bar-like shape.

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12. A food product according to any one of the preceding claims, wherein the food product is provided in a vacuum packed package.

13. A food product according to claim 12, wherein the package is sterilised.

14. A food product according to any one of the preceding claims, wherein the sea urchin from which the roe are obtained is the species, *Evechinus roboticus*.

15. A method of making a sea urchin food product comprising the steps of:  
mixing sea urchin roe with an edible binding material, and  
baking the mixture to form said food product in unitary form.

16. A method according to claim 15, wherein the roe comprises broken roe.

17. A method according to claim 15 or 16, wherein the roe comprises whole roe.

18. A method according to claim 17, wherein the whole roe substantially retains its original shape in the food product.

19. A method according to claim 17 or 18, wherein whole roe are substantially visible at the surface of the baked food product.

20. A method according to any one of claims 15 to 19, further comprising the step of making the binding material by mixing an ingredient selected from the group consisting of flour, starch, and a mixture thereof, with egg.

21. A method according to claim 20, wherein the flour is selected from the group consisting of rice flour, wheat flour, and a mixture thereof.

22. A method according to any one of claims 15 to 21, further comprising the step of adding a seasoning to the binding material.

23. A method according to claim 22, wherein the seasoning is selected from the group consisting of mirin vinegar, vinegar, wine, sake, an amino acid, and any mixture thereof.

24. A method according to any one of claims 15 to 23, wherein the baking occurs for about 15-25 minutes at about 150-200°C.

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25. A method according to any one of claims 15 to 24, wherein the food product has a colour in the range from yellow to orange to a reddish or brownish-yellow or a reddish or brownish-orange.

5 26. A method according to any one of claims 15 to 25, wherein the food product is baked in a baking vessel to have a plate-like or bar-like shape.

27. A method according to any one of claims 15 to 26, further comprising the step of vacuum packing the food product in a package.

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28. A method according to claim 27, further comprising the step of sterilizing the package.

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29. A method according to claim 28, wherein the package is sterilized by being boiled in water for a sufficient time to effect sterilisation.

30. A method according to any one of claims 15 to 29, wherein the sea urchin from which the roe are obtained is the species, *Evechinus roboticus*.

20

31. A method according to claim 15 substantially as herein described with reference to any embodiment disclosed.

32. A sea urchin food product when made by the method of any one of claims 15 to 31.

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33. A sea urchin food product substantially as herein described with reference to any embodiment shown in the accompanying drawings.

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MITSUO HORIGUCHI

By the authorised agents

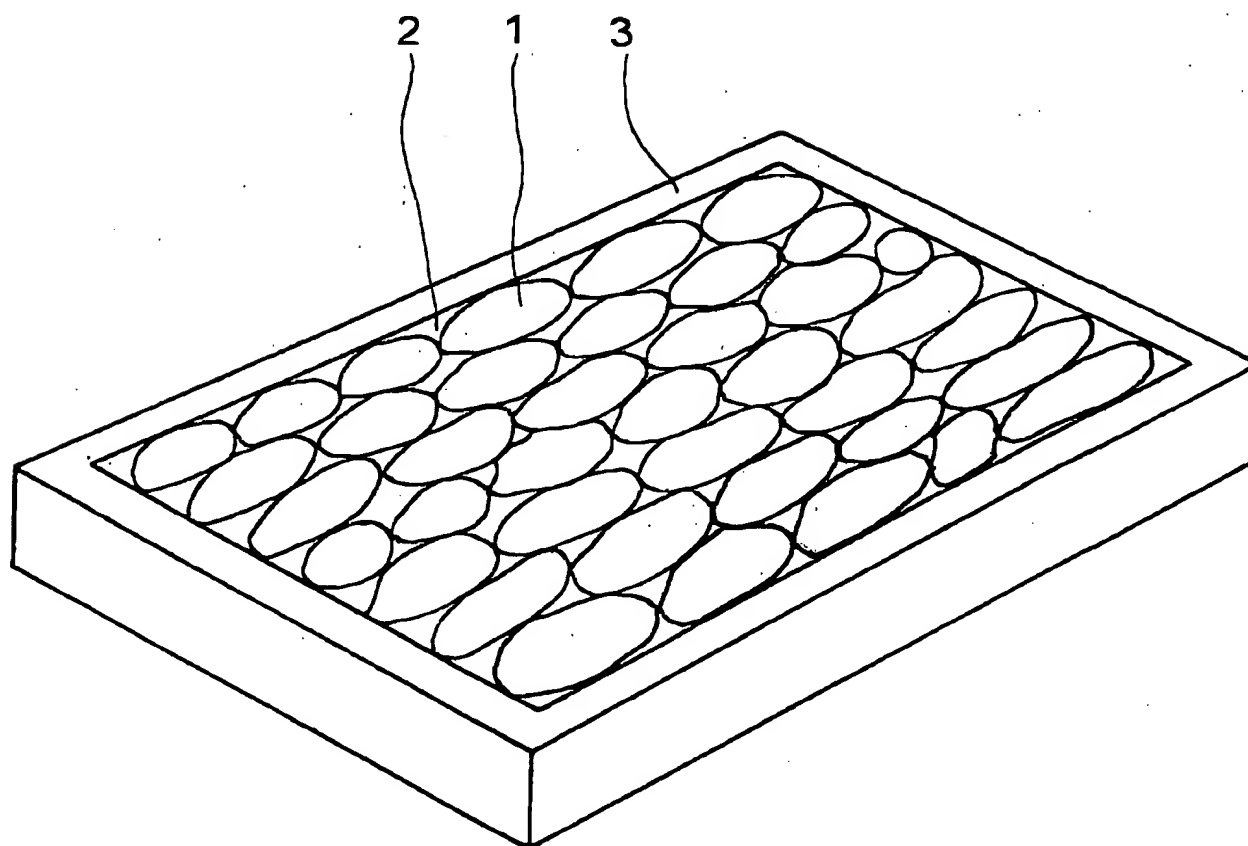
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**FIG. 1**